MICHIGAN

FOREST PEST DETECTION PROGRAM

REPORT FOR 1954

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COMPILED BY

FORESTRY DIVISION,
MICHIGAN DEPARTMENT OF CONSERVATION

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COOPERATORS

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SCHOOL OF NATURAL RESOURCES, UNIVERSITY OF MICHIGAN

UNITED STATES FOREST SERVICE

PRIVATE FOREST INDUSTRY

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INTRODUCTION

The Michigan Forest Pest Detection Program was organized in the spring of 1950 through the efforts of several state and federal agencies. Each agency cooperating in the program contributes in its respective field to the problem of forest insects and diseases on a statewide basis.

Using a system of permanent observation areas (See Map I), information on forest pests is obtained throughout the state, with particular emphasis on certain "critical" insects. In this way, pest population levels are closely followed, providing valuable data for forest protection.

The Fourth Annual Lake States Forest Insect Survey Conference was held in Milwaukee in April. Representatives of federal, state and private agencies participated. One of the chief problems confronting this group is the standardization and coordination of survey techniques and activities in Minnesota, Wisconsin and Michigan.

Close coordination between corresponding agencies in the Great Lakes region has been made possible through the formation of the Central International Forest Insect and Disease Conference. At this conference, entomologists, pathologists and foresters from the three Lake States and adjoining Canadian Provinces are able to discuss mutual forest pest problems and present research findings. The third meeting of this conference was held in October at Wisconsin Rapids, Wisconsin.

The following report of the activities of the Michigan Forest Pest Detection Program during 1954 was prepared by the Forestry Division of the Michigan Conservation Department.

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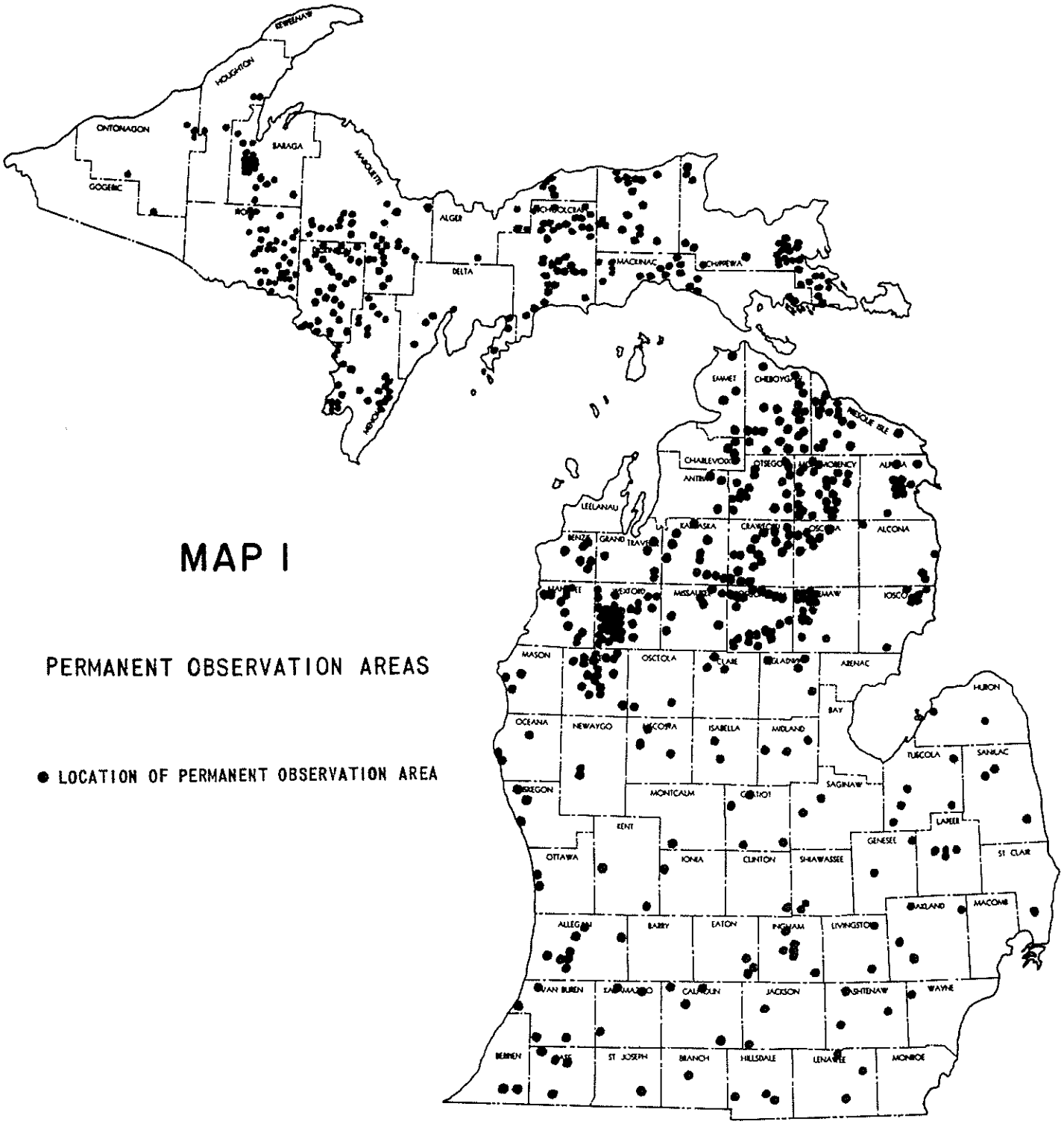


MAP I

PERMANENT OBSERVATION AREAS

● LOCATION OF PERMANENT OBSERVATION AREA

FOREST INDUSTRY COOPERATION

Forest industry, recognizing the threat of insects and diseases to existing and future forest resources, became an integral part of the Michigan Forest Pest Detection Program during the past year. On private forest lands in the state, 36 permanent observation areas were established in 1954. The addition of these areas to the existing system has materially increased the forest insect detection coverage of the state.

The following companies are now actively participating in the forest insect detection program:

Kimberly-Clark of Michigan, Inc.
Escanaba Paper Company
Oliver Mining Company
Patten Logging Company
Wisconsin-Michigan Power Company
Cleveland-Cliffs Iron Company
Consumers' Power Company
Nekoosa-Edwards Paper Company

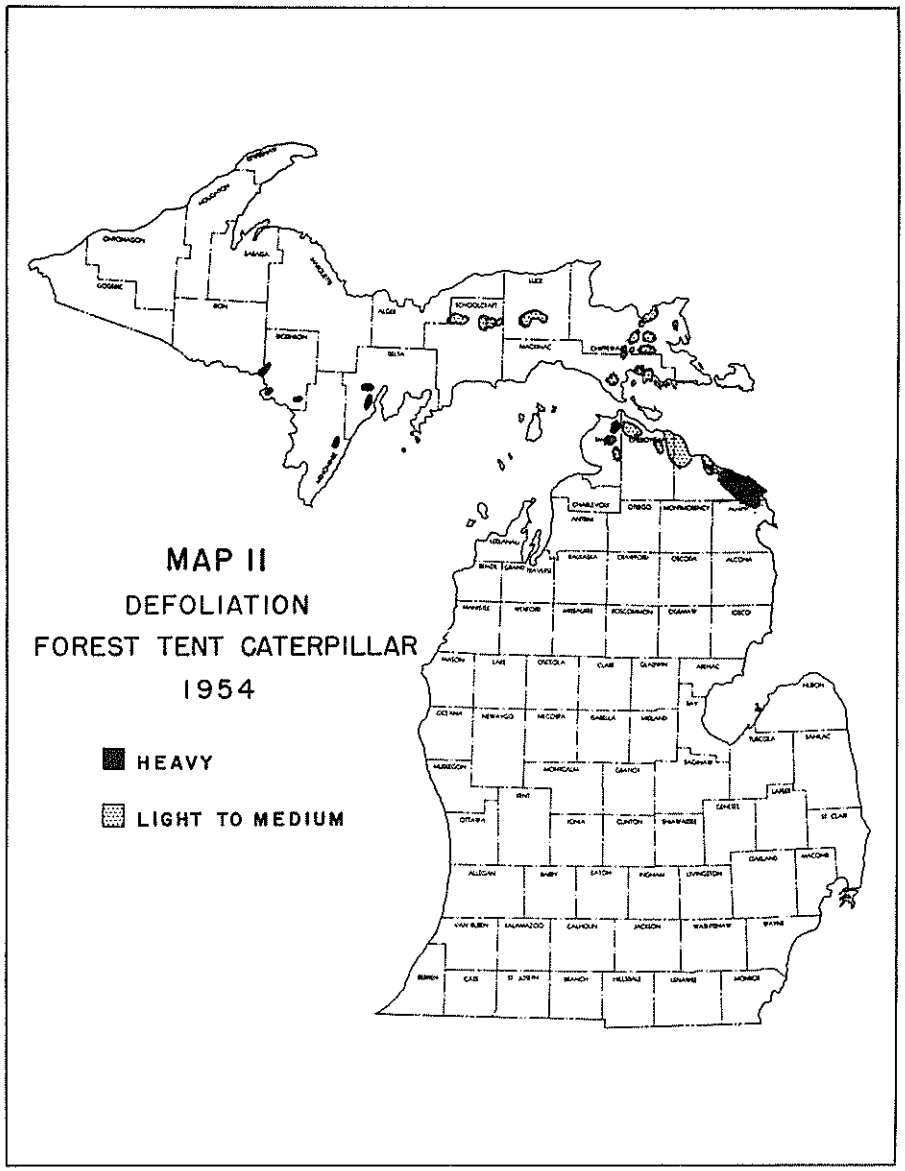
SPECIAL SURVEYS

FOREST TENT CATERPILLAR

The forest tent caterpillar outbreak, first detected in 1947, declined sharply throughout the majority of the infestation area in Michigan in 1954 as was the case in most of the other outbreak areas in the Great Lakes region. A factor contributing largely to this was the low temperatures encountered after some of the overwintering egg masses had begun to hatch on April 30 and May 1. Temperatures in the low 20's were recorded for from three to five days in many of the infestation areas. These temperatures retarded foliage development and resulted in larval starvation.

On June 30, an aerial survey was made to map defoliated areas in the Upper Peninsula with another flight on July 7 to complete the survey in the Lower Peninsula. These surveys, together with ground observations, showed a very large decrease in defoliated area. Heavy defoliation was recorded only in Delta, Dickinson and Menominee counties in the Upper Peninsula and in Emmet and Presque Isle counties in the Lower Peninsula (See Table I and Map II).

An egg mass survey was made during the fall to determine approximate population densities in the spring of 1955. In addition to Forestry Division personnel, assistance in making the survey was given by Paul R. Flink, forest entomologist for Kimberly-Clark, and Forest Service Rangers Quentin R. Boerner and W. G. Wilson. Expected infestation areas in 1955 are shown on Map III.


MAP II
DEFOLIATION
FOREST TENT CATERPILLAR
1954
HEAVY
LIGHT TO MEDIUM

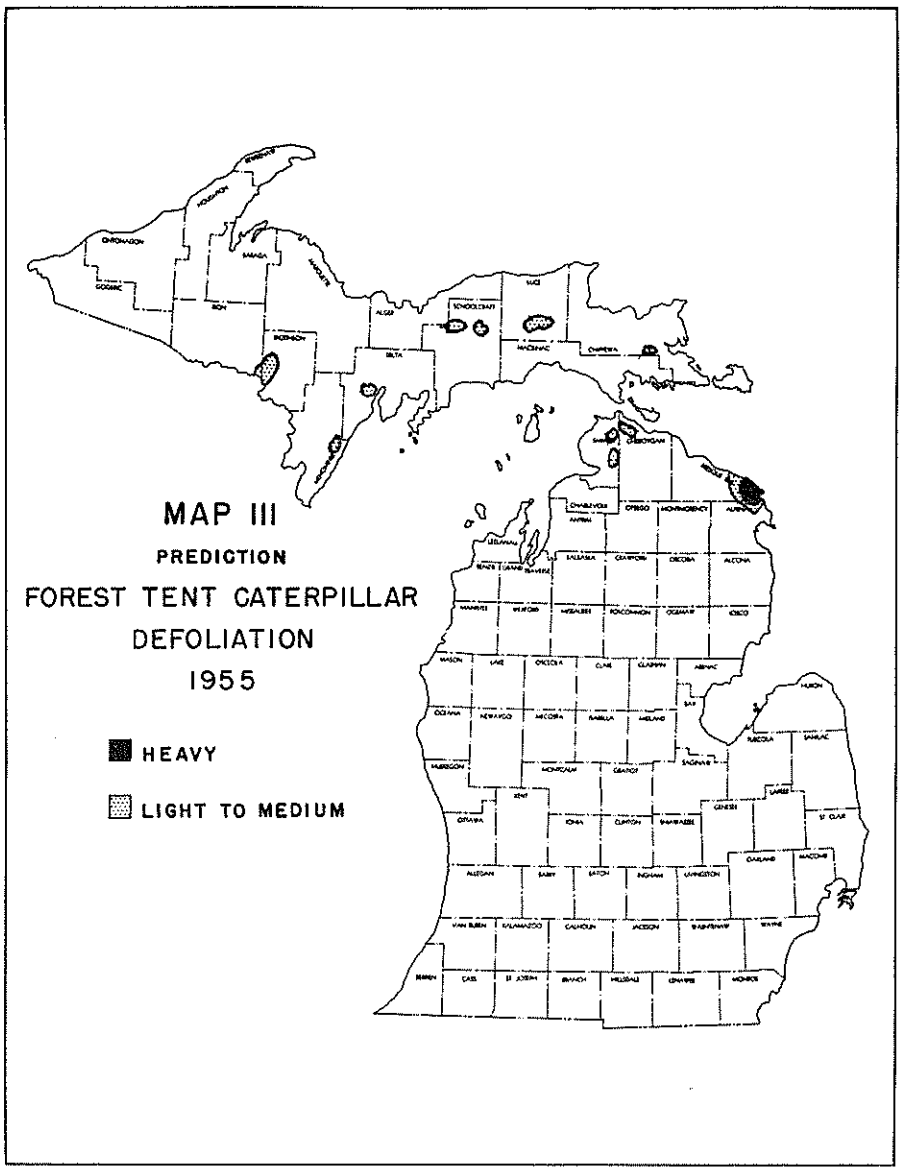

MAP III
PREDICTION
FOREST TENT CATERPILLAR
DEFOLIATION
1955
HEAVY
LIGHT TO MEDIUM

TABLE I

FOREST TENT CATERPILLAR ACRES DEFOLIATED - 1954

COUNTY	LIGHT	MEDIUM	HEAVY	TOTAL
Alpena	--	--	1,760	1,760
Cheboygan	1,280	49,280	--	50,560
Chippewa	12,800	31,360	--	44,160
Delta	--	--	6,720	6,720
Dickinson	--	--	5,120	5,120
Emmet	490	1,600	1,280	3,370
Iron	--	--	1,440	1,440
Luce	--	19,640	--	19,640
Mackinac	--	25,920	--	25,920
Menominee	--	--	320	320
Presque Isle	--	53,760	61,440	115,200
Schoolcraft	--	10,240	8,320	18,560
TOTALS	*14,570*	*191,800*	*86,400*	*292,770*

Total area defoliation figures by years are shown as follows:

1947-50	Undetermined
1951	690,000 acres
1952	1,133,000 acres
1953	1,468,000 acres
1954	292,770 acres

REDHEADED PINE SAWFLY

During the last week in June, a reconnaissance survey of egg batches of the redheaded pine sawfly was conducted in two planted areas in the Grand Sable State Forest in Alger and Schoolcraft counties. These jack pine plantations were lightly infested in 1953 and this survey was made to establish population levels in 1954. The survey showed 7.1% of the trees in Section 15, T48N, R15W to have one or more egg batches per tree, and 18.5% of the trees in Sections 14-15, T47N, R15W to have one or more egg batches per tree. The latter figure represented a heavy enough infestation to warrant control measures. (See "Direct Control Projects.")

SPRUCE BUDWORM

An outbreak of the spruce budworm was detected by Kimberly-Clark personnel in overmature stands of balsam fir and spruce in Keweenaw County late in 1953. Observation in the area pointed out that the infestation had been present for at least six years but because the infested area was relatively inaccessible, the presence of the insect was not detected earlier.

Early in July, a preliminary ground reconnaissance survey was made by Dr. H. J. MacAloney, Chief, Division of Forest Insect Research, Lake States Forest Experiment Station, and Paul R. Flink. The following week an aerial survey, using a Conservation Department plane, was made to give additional information on the presence of the pest. These surveys showed heavy to complete defoliation over 2,500 acres and lighter infestations in other smaller areas of undetermined size.

The heavily infested area is in the process of being logged, the operation to be completed within two years, and no chemical control measures are being planned at the present time.

WALKINGSTICK

An aerial survey was made on September 11 to map areas defoliated by this biennial insect in the oak hills of the Ogemaw and Au Sable State Forests and the Huron National Forest. A ground survey of the population center in Dickinson County in the Upper Peninsula was made by Paul R. Flink. Table II shows the acreage defoliated by this annoying pest in 1954. Compared with 1952, the area defoliated in Ogemaw County has increased 1,540 acres.

TABLE II

WALKINGSTICK ACRES DEFOLIATED - 1954

COUNTY	ACRES (Heavy Defoliation)
Ogemaw	23,040
Crawford	1,120
Oscoda	960
Roscommon.	330
Dickinson.	800
TOTAL	*26,250*

Heavy defoliation has occurred in areas in Ogemaw and Crawford counties in even years since before 1930. There is little evidence of current mortality to the host trees, although undoubtedly past infestations have eliminated smaller trees and have probably contributed to stag-headedness in certain larger black oaks.

DIRECT CONTROL PROJECTS

REDHEADED PINE SAWFLY

On August 11-13, 80 acres of mixed red and jack pine plantations (NESE, Sec. 15, NWSW, Sec. 14, T47N, R14W, Schoolcraft County) in the Grand Sable State Forest were sprayed for control of this sawfly. Prison labor was used with the area being sprayed by hand. A 12% solution of DDT was applied at the rate of 0.7 gallon per acre with evaluation showing 97.1% control. Cost of the project was $1.16 per acre which includes the cost of insecticide, vehicle mileage, labor and foreman supervision.

JACK PINE SAWFLY

On June 11-12, approximately 20 acres of pole-sized jack pine in the Houghton Lake State Forest (parts of NENW and NWNE, Sec. 9, T23N, R4W, Roscommon County) heavily infested with the jack pine sawfly were sprayed using a mist blower. An attempt was made to thoroughly cover infested trees regardless of the amount of insecticide used. Control was obtained on the lower portions of the trees but the project was not considered successful because the machine was not capable of depositing sufficient insecticide in the tree tops. The insecticide used was DDT 50% Wettable Powder applied at the rate of three pounds per 100 gallons of water.

EUROPEAN PINE SHOOT MOTH

Starting on June 26, 1,200 acres of scattered red and Scotch pine plantings in Ottawa and Muskegon counties were sprayed from the air for control of the European pine shoot moth. This was a cooperative project between Christmas tree producers and the U.S. Soil Conservation Service. A 12½% oil solution of DDT was applied at the rate of one gallon per acre at a cost of $3.00 per acre for all plantations regardless of their size. Although no detailed control evaluations were made, Christmas tree growers are of the opinion the control project is paying off in reduced injury to their trees.

SARATOGA SPITTLEBUG *

Hiawatha National Forest - During the last week in July and the first week in August, 494 acres of red and jack pine plantations were sprayed by airplane for control of the Saratoga spittlebug. A 12½% solution of DDT was applied at the rate of one gallon per acre and evaluation showed 100% control. Costs were $0.42 per acre for the aerial application.

Ottawa National Forest - During the same period, 1,083 acres of red pine plantations were sprayed from the air for control of this spittlebug. A 12½% solution of DDT was applied at one gallon per acre. Control evaluations showed an average population reduction of 84.2% (69 to 100%) on the four areas sprayed. Cost of aerial application was $0.42 per acre.

OBSERVATION REPORTS

During the 1954 season, a total of 2,067 observation reports was received and evaluated in the Lansing office of the Forestry Division. Of these, 39.5% showed the presence of specific forest insect pests. Included in this total are 90 reports received from industrial foresters. The above figure represents an increase of 115 reports over the 1953 total.

The total number of permanent observation areas is now 728. This figure includes the 36 observation areas established by forest industry personnel and 40 observation areas established in 1953 in the Manistee National Forest by Lake States Forest Experiment Station personnel. The latter were inadvertently omitted from the 1953 total. The balance are on state forest lands, farm plantations and other private holdings.

CRITICAL INSECTS

The list of critical forest insects may change in different regions from time to time as potentially dangerous outbreaks occur and as forest conditions change. The forest insects discussed in this section of the report are those that were on the critical insect list during 1954. The detection of the spruce budworm in the Keweenaw Peninsula warrants its inclusion on the critical list for the Upper Peninsula in 1955 and permanent observation areas will be established for this insect.

* DATA RECEIVED FROM THE U.S. FOREST SERVICE AND THE LAKE STATES FOREST EXPERIMENT STATION.

JACK PINE BUDWORM - *Choristoneura pinus* Free.

Summary of Reports

	1951	1952	1953	1954
Total.....	135	185	232	280
Percent Positive.....	38	40	32	20

Breakdown of 1954 Reports

Heavy defoliation ..... 3 ..... (5.4%)
Medium defoliation ..... 7 ..... (12.5%)
Light defoliation ..... 46 ..... (82.1%)

Continued decline of this budworm was reported in the Lower Peninsula in all but relatively new infestation areas. There appeared to be three distinct population centers in Michigan in 1954. These were: Lake and Grand Traverse counties in the Lower Peninsula, and Luce County in the Upper Peninsula. Defoliation intensity increased over 1953 in the two Lower Peninsula counties while declining to an endemic condition over most of the rest of the northern half of the Lower Peninsula. The heavy population center in the Luce County outbreak shifted this season. In 1953, heaviest damage was encountered in dense jack pine pole stands in the western part of the outbreak, while in 1954 defoliation was much less severe here but much heavier in the open-grown stands on the eastern side of the outbreak. The infestation area in Luce County remained about the same as in 1953. The infestation in Delta County continued at a low population level. Three reports of this pest were received from Marquette County during the season, representing the initial detection of the pest in this part of the state. (See Map IV).

REDHEADED PINE SAWFLY - *Neodiprion lecontei* (Fitch)

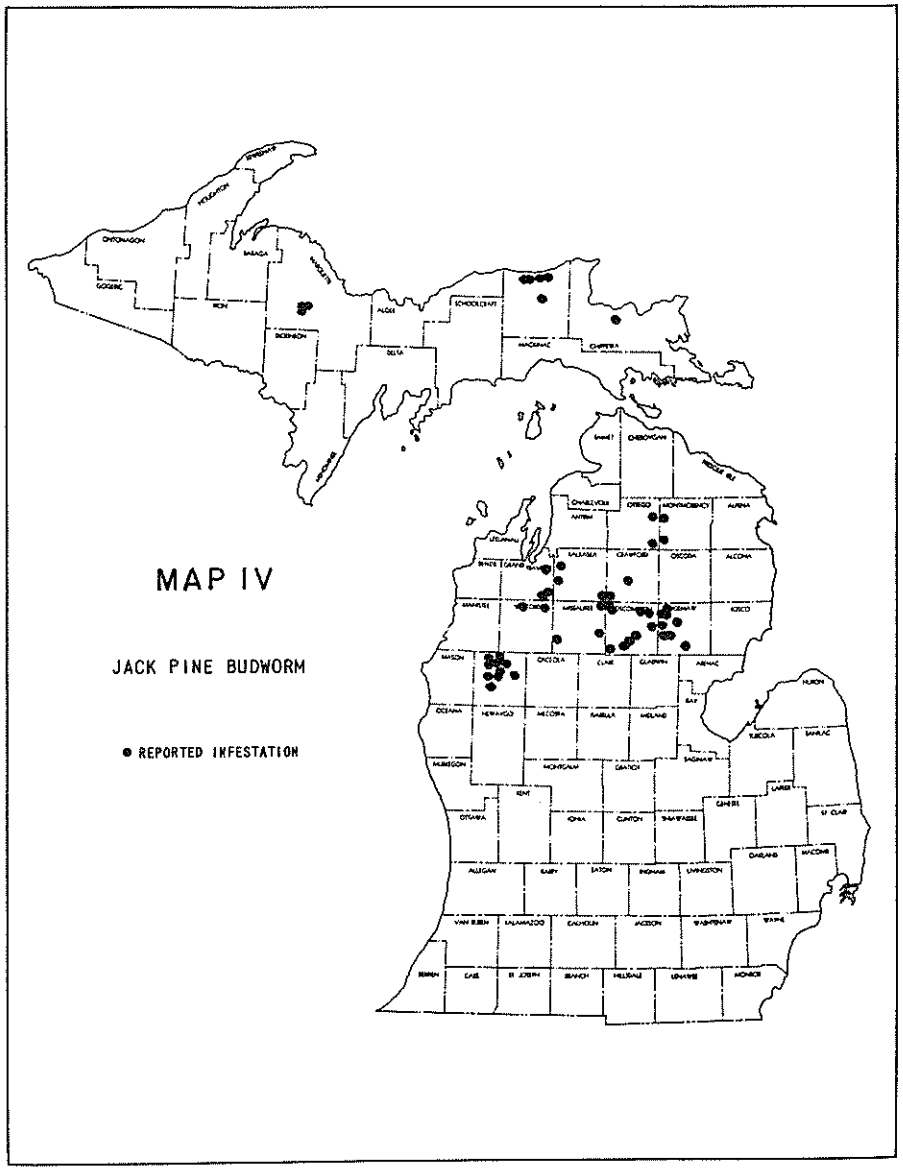
Summary of Reports

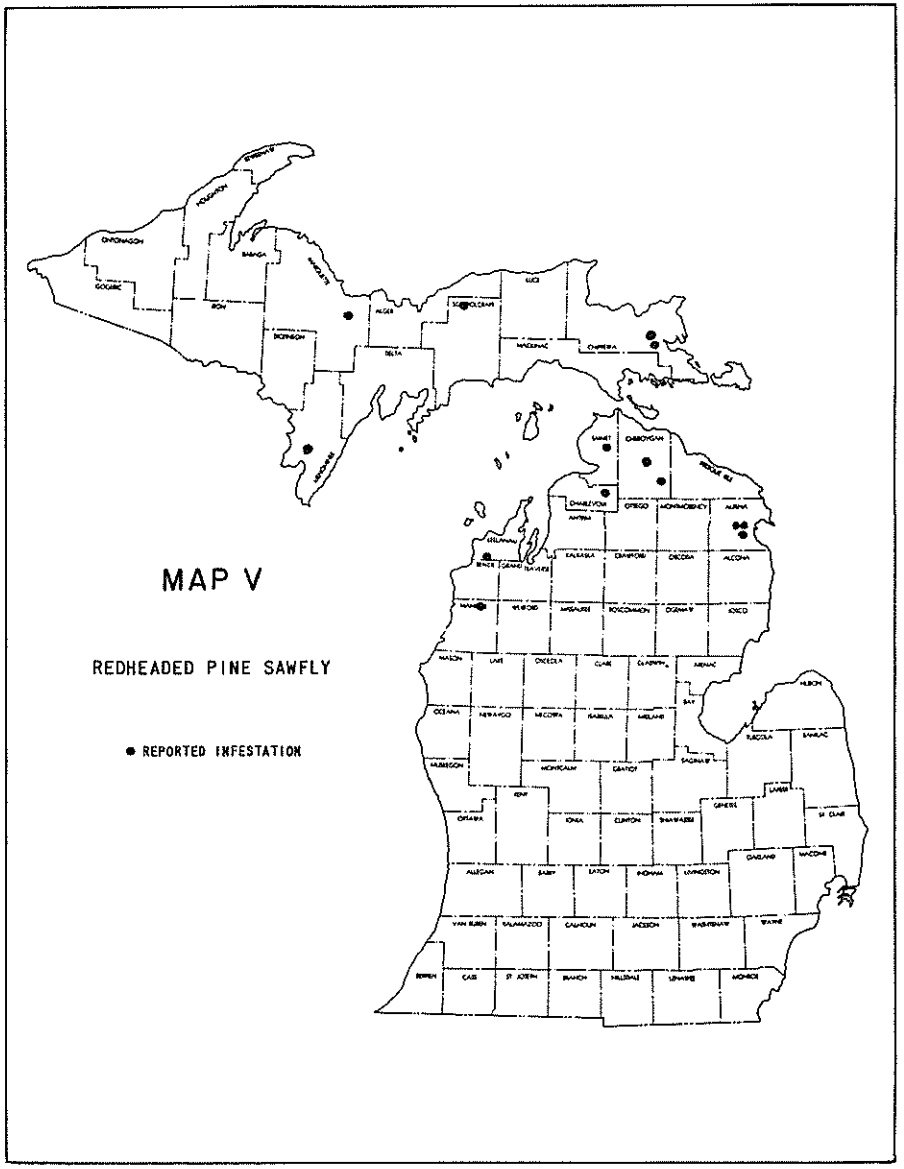
	1951	1952	1953	1954
Total.....	133	173	231	230
Percent Positive.....	18	7	8	8

Breakdown of 1954 Reports

Heavy defoliation ..... 1 ..... (5.3%)
Medium defoliation ..... 3 ..... (15.8%)
Light defoliation ..... 15 ..... (78.8%)

Reports showed a slight state-wide decrease in the injury caused by this sawfly in 1954 with little change in populations over 1953. Schoolcraft and Chippewa counties in the Upper Peninsula and Leelanau County in the Lower Peninsula showed the greatest concentrations. The infestation center in Leelanau County was detected during the latter part of the season and further detection surveys in this area showed the pest to be present over some 220 acres of jack and red pine plantations. A detailed reconnaissance survey is planned in this heavily planted area in 1955. Continued reconnaissance surveys also are scheduled in the Grand Sable State Forest. (See Map V.)


MAP IV
JACK PINE BUDWORM
● REPORTED INFESTATION


MAP V
REDHEADED PINE SAWFLY
● REPORTED INFESTATION

LARCH SAWFLY - *Pristiphora erichsonii* (Htg.)

Summary of Reports

	1951	1952	1953	1954
Total.....	68	113	137	135
Percent positive.....	0	30 *	42	73 *

* THE APPARENT INCREASE IS LARGELY DUE TO INTENSIFIED SURVEYS RATHER THAN BUILDUP OF INSECT POPULATIONS.

Breakdown of 1954 Reports

Heavy defoliation 0
Medium defoliation ..... 8 ..... (8.1%)
Light defoliation .....91 ..... (91.9%)

As a result of an intensified survey made in the northern half of the Lower Peninsula and previous surveys in the Upper Peninsula, this sawfly has now been detected over most of the tamarack-growing area of the state. As in 1953, nowhere was heavy defoliation encountered except on scattered trees. Highest populations appeared to be in Houghton County and eastern Schoolcraft County in the Upper Peninsula and in Crawford County in the Lower Peninsula. (See Map VI.)

SARATOGA SPITTLEBUG - *Aphrophora saratogensis* (Fitch)

Summary of Reports

	1951	1952	1953	1954
Total.....	17	51	164	211
Percent positive.....	88	27	34	23

Breakdown of 1954 Reports

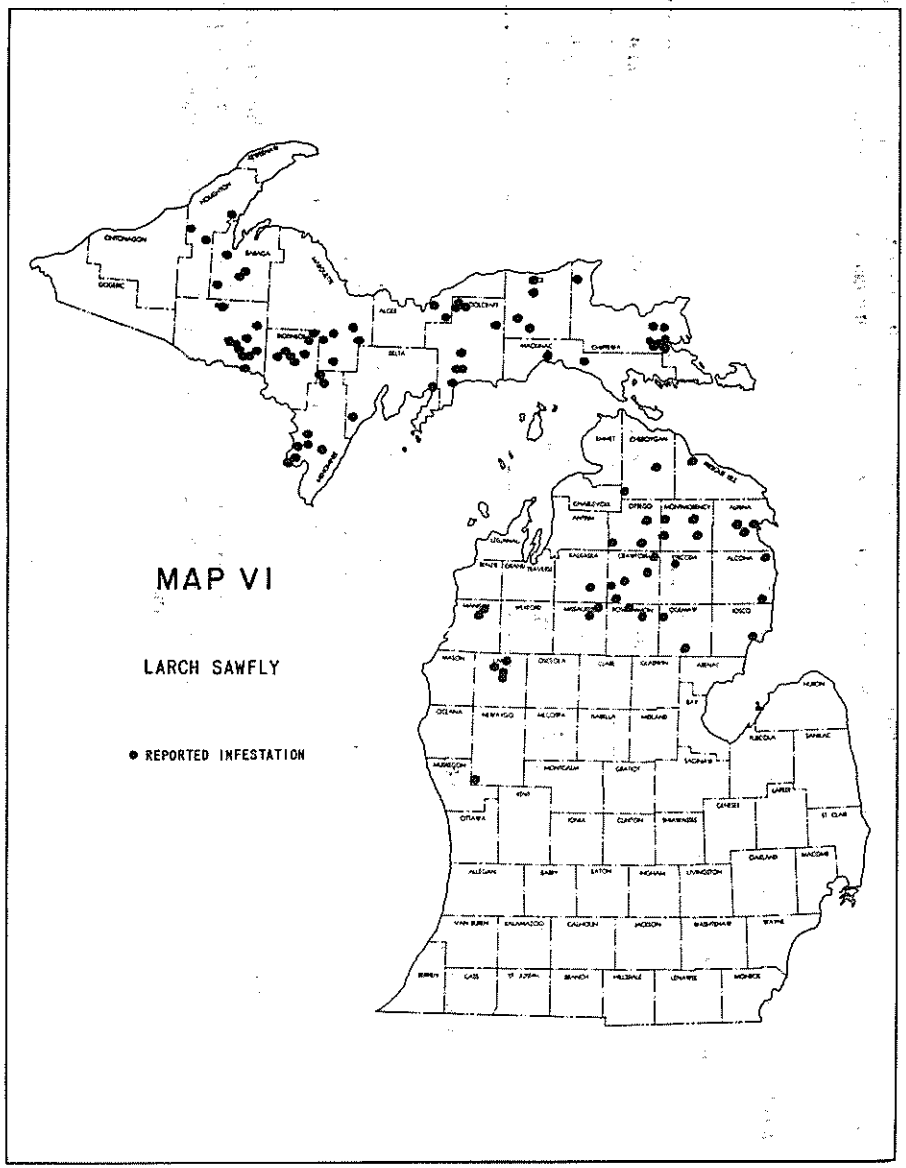
Heavy injury ..... 1 ..... (2.1%)
Medium injury ..... 2 ..... (4.2%)
Light injury ..... 45 ..... (93.7%)

Reports indicated a slight increase of populations of the Saratoga spittlebug over most of the northern part of the state. Heavy infestations were reported in plantations of red and jack pine on federal lands in the Hiawatha and Ottawa National Forests. However, heavy injury on state lands was reported only in one plantation of red and jack pine in the Black Lake State Forest in Presque Isle County.

WHITE PINE WEEVIL - *Pissodes strobi* (Peck)

Summary of Reports

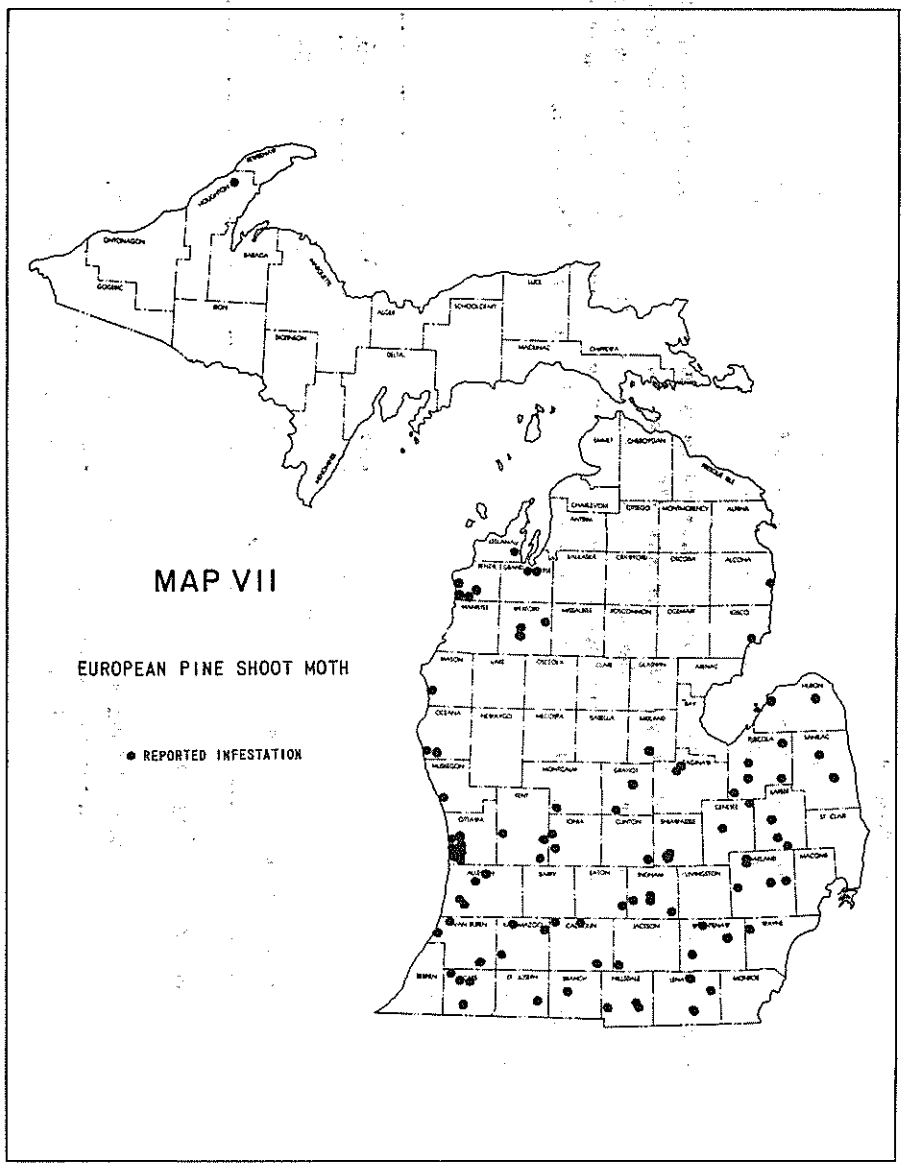
	1951	1952	1953	1954
Total.....	39	33	231	278
Percent positive.....	82	64	65	59



MAP VI

LARCH SAWFLY

● REPORTED INFESTATION



MAP VII

EUROPEAN PINE SHOOT MOTH

● REPORTED INFESTATION

Breakdown of 1954 Reports

Heavy infestation	11	(6.7%)
Medium infestation	13	(7.9%)
Light infestation	140	(85.4%)

Observation reports in 1954 showed a slight decrease in the populations of this pest. However, in local areas of Chippewa, Lake and Allegan counties, over 60% of the terminals of jack and white pine were damaged. No reports were received showing injury to red pine on any of the permanent observation areas but a verbal report was received of the insect attacking red pine in the Ottawa National Forest in the west end of the Upper Peninsula.

ANOMALA BEETLE - *Pachystethus oblivia* (Horn)

Summary of Reports

	1951	1952	1953	1954
Total.....	119	181	236	278
Percent positive.....	35	36	32	38

Breakdown of 1954 Reports

Heavy defoliation	15	(14.8%)
Medium defoliation	16	(15.8%)
Light defoliation	70	(69.4%)

Feeding injury was more severe than in recent years. The northern part of Montmorency County was extremely hard hit with up to 100% defoliation resulting. Lake, Alcona, Kalkaska, and Penzie counties also reported heavy injury. The insect has not been detected in the Upper Peninsula.

LARCH CASEBEARER - *Coleophora laricella* (Hbn.)

Summary of Reports

	1951	1952	1953	1954
Total.....	106	105	125	137
Percent positive.....	94	96	79	69

Breakdown of 1954 Reports

Heavy defoliation	5	(5.4%)
Medium defoliation	4	(4.2%)
Light defoliation	85	(90.4%)

Following the population peaks in 1951 and 1952, further decline in the populations of this pest occurred in 1954. Many observation areas that showed the insect to be present in 1953 were reported negative in 1954. Heaviest injury was found locally in Marquette, Delta, and Chippewa counties in the Upper Peninsula.

EUROPEAN PINE SHOOT MOTH - *Rhyacionia buoliana* (Schiff.)

Summary of Reports

	1951	1952	1953	1954
Total.....	44	80	119 *	203 *
Percent positive.....	80	40	47	39

* INCREASE DUE TO INCLUSION OF INSECT ON CRITICAL LIST OF DISTRICTS IN NORTHERN HALF OF LOWER PENINSULA.

Breakdown of 1954 Reports

Heavy injury ..... 16 ..... (20.3%)
Medium injury ..... 8 ..... (10.1%)
Light injury ..... 55 ..... (69.6%)

Reports indicated a slight decline in injury by this pest as compared to 1953 throughout the southern part of the Lower Peninsula. Heaviest damage to red and Scotch pine plantings was reported in the Washtenaw-Livingston County area and in Ottawa County.

Overwintering larvae of this introduced insect are reported to be unable to withstand temperatures below -18 degrees Fahrenheit. Northern distribution of the insect has been supposedly regulated by this temperature factor. However, an infestation of the pest was detected in Houghton County in the Keweenaw Peninsula where minimum temperatures annually fall well below the lethal level. From the appearance of the infested trees, the population has persisted there for several years, apparently being little affected by the temperatures encountered in this area. This detection adds to the list of outlying infestations found in other northerly parts of the state, namely in Wexford, Benzie, Manistee, Grand Traverse and Alcona counties. (See Map VII). Collections of overwintering larvae in Houghton and Wexford counties were made for study at the Canadian Forest Insect Laboratory in Sault Ste. Marie, Ontario.

EUROPEAN PINE SAWFLY - *Neodiprion sertifer* (Geoff.)

Summary of Reports

	1951	1952	1953	1954
Total.....	31	64	85	82
Percent positive.....	87	69	74	75

Breakdown of 1954 Reports

Heavy defoliation ..... 2 ..... (3.3%)
Medium defoliation ..... 6 ..... (9.8%)
Light defoliation ..... 53 ..... (86.9%)

Abundance of this pest in coniferous plantings throughout the southern part of the Lower Peninsula was slightly less than in 1953. Populations nevertheless remained rather high in susceptible stands, especially in Oakland and Washtenaw counties.

PINE SPITTLEBUG - *Aphrophora parallela* (Say)

This insect was removed from the critical insect list for the Upper Peninsula and northern half of the Lower Peninsula in 1954 and placed on the list for the southern half of the Lower Peninsula.

Breakdown of 1954 Reports

Total	73	
Percent positive	37	
Heavy injury	1	(3.7%)
Medium injury	4	(14.8%)
Light injury	22	(81.5%)

Populations of this pest remained about the same as in 1953. Heavy concentrations of the insect were found on jack pine in the Baraga Plains in Baraga County, but as yet little damage has resulted.

FOREST TENT CATERPILLAR - *Malacosoma disstria* Hbn.

Breakdown of 1954 Reports

Total	117	
Percent positive	23	
Heavy defoliation	6	(22.2%)
Medium defoliation	1	(3.7%)
Light defoliation	20	(74.1%)

See "Special Surveys" for details of the outbreak of this insect.

OTHER IMPORTANT INSECTS

Details have already been given under "Special Surveys" of the spruce budworm and walkingstick outbreaks. Following is information concerning other important forest insect pests occurring in the state during the 1954 season.

GYPSY MOTH - *Porthetria dispar* (L.)

On May 19, 1954, gypsy moth larvae were detected near the south city limits of Lansing, the first recent record of the insect west of eastern Pennsylvania. The Bureau of Plant Industry of the State Department of Agriculture immediately reported this discovery to federal authorities in Washington, requesting the assistance of personnel experienced in gypsy moth work to organize and direct a survey and control program in the Lansing area. These men, with the aid of Bureau of Plant Industry and Conservation Department personnel, conducted surveys that located infestations in other parts of the Lansing metropolitan area. These were immediately sprayed from the ground by the City Forestry Department to prevent spread of first-instar larvae while an aerial control project was being organized. The aerial control project was started June 6 and completed June 10. A private contractor furnished a four-engined plane (B-17) to spray the metropolitan area and three Stearman bi-planes for the outlying less-populated areas. At the completion of the project, 59,022 gallons of insecticide had been applied to an area of 86,400 acres at a cost of $76,559.82 for materials and application.

During the latter part of June and July, an adult gypsy moth trapping program was carried out in a 25 mile radius of Lansing. The traps, baited with a male moth attractant, were placed two to the square mile, employing a total of 5,000 traps, making this one of the largest gypsy moth trapping projects on record. Twenty-five men patrolled the traps until well after flight of the moths was completed. Male moths were captured in only four traps, one of these within the sprayed area near Lansing, two near Grand Ledge and one near Portland. A detailed search of these areas for new egg masses was nearly complete at the end of the year. Present plans of the Bureau of Plant Industry call for control measures to be applied in 1955 in all areas where moths were trapped or where new egg masses were found.

Special recognition should be given to the Michigan "Little Legislature" for immediate appropriation of emergency funds and to the Bureau of Plant Industry for the prompt and efficient way in which the spray project was completed. Seldom has a job of such magnitude been set up and carried out in so short a time. Through this action, initial infestations have been nearly eliminated and through continued action, it is almost certain that the gypsy moth will be completely eradicated from the state.

PINE TORTOISE SCALE - *Toumeyella numismaticum* (Pettit and McD.)

This scale insect was reported in several counties in both peninsulas with by far the worst infestation occurring in Schoolcraft County between Seney and Shingleton. Here, over three square miles of scattered natural jack pine stands are suffering heavy mortality. The predatory twice-stabbed lady beetle, *Chilocorus stigma* (Say), has been observed here in abundance. At the present time, because of the relatively low value of the jack pine, no chemical control measures are being planned.

BIRCH SKELETONIZER - *Bucculatrix canadensisella* Chamb.

Another general epidemic of this pest occurred over most of the area in the state where white birch occurs in both the Upper Peninsula and the northern half of the Lower Peninsula. No permanent injury has been observed although complete browning of foliage occurred late in August in many areas.

BIRCH LEAF MINER - *Fenusa* sp.

A heavy attack by this insect occurred for the second year over several square miles of white birch type in northern Luce County. As with the birch skeletonizer, little permanent injury is apparent.

JACK PINE SAWFLY - *Neodiprion americanus banksianae* Roh.

This sawfly was reported locally in jack pine sapling and pole stands in Gladwin, Roscommon, Crawford, Marquette and Houghton counties. In many of the reported areas, larvae of the insect completely removed all of the old foliage from infested trees. This insect is becoming increasingly abundant.

CHERRY SCALLOP SHELL MOTH - *Calocalpe undulata* (L.)

A widespread outbreak of this insect occurred over the northwestern part of the Lower Peninsula during the summer. There was complete defoliation of wild cherry in many areas, especially in Wexford County.

RED HUMPED CATERPILLAR - *Schizura concinna* (A. & S.)

Over 300 acres of hard maple stands on Beaver Island, Charlevoix County, were heavily defoliated by this pest. This observation was made by a representative of the Lands Division

of the Conservation Department while making a land appraisal on the island. The insect was identified from larvae collected there. No other large infestations on this insect have been reported in recent years.

EASTERN TENT CATERPILLAR - *Malacosoma americana* (F.)

The outbreak of this pest of wild cherry and other hardwoods in the northern half of the Lower Peninsula declined to an endemic level in 1954.

DISEASES

OAK WILT

Aerial surveys for oak wilt disease were again conducted in the summer of 1954 using a Conservation Department plane in a continuation of the search for new spots of infection. The disease was first confirmed in Michigan in 1951, and is known to be spreading in at least 19 Midwestern States. It is believed to have been in Michigan several years prior to its discovery.

The main part of this year's survey was a recheck at 2-mile intervals of certain heavily infected counties, and an inspection of locations in other counties. Rechecked were Barry, Kalamazoo, Calhoun, Berrien, Cass and St. Joseph counties. In addition the Allegan State Forest in Allegan County was reflown but no diseased areas were found. Kent and parts of Newaygo, Montcalm and Ionia counties were carefully checked (2-mile intervals) in preparation for a control experiment. A single flight over oak areas in Ottawa, Muskegon, Oceana, Mason, Lake and Newaygo counties extended the survey farther north than previously, but revealed no wilt. A total of approximately 4,120 miles of line were flown, requiring 62.1 hours of flying time, at a cost of $439.50 for plane and pilot.

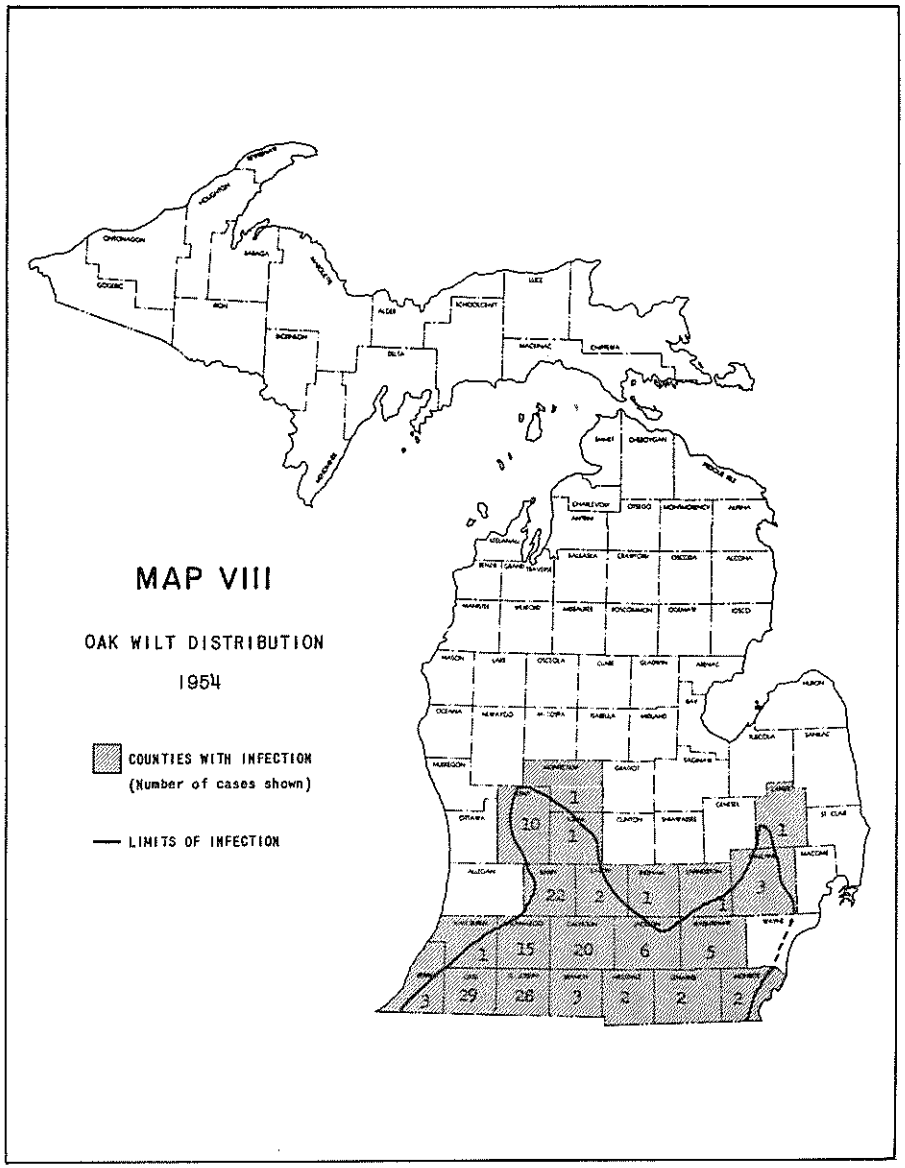
Ground checking following aerial spotting of suspected locations was done by the oak wilt survey representative of the State Department of Agriculture, working with Conservation Department district foresters. Over 300 suspected locations were visited, and 55 new disease areas were diagnosed from field symptoms. The total known wilt locations is now 158. (See Map VIII). This is still a relatively small number and represents a small area in comparison to many other states.

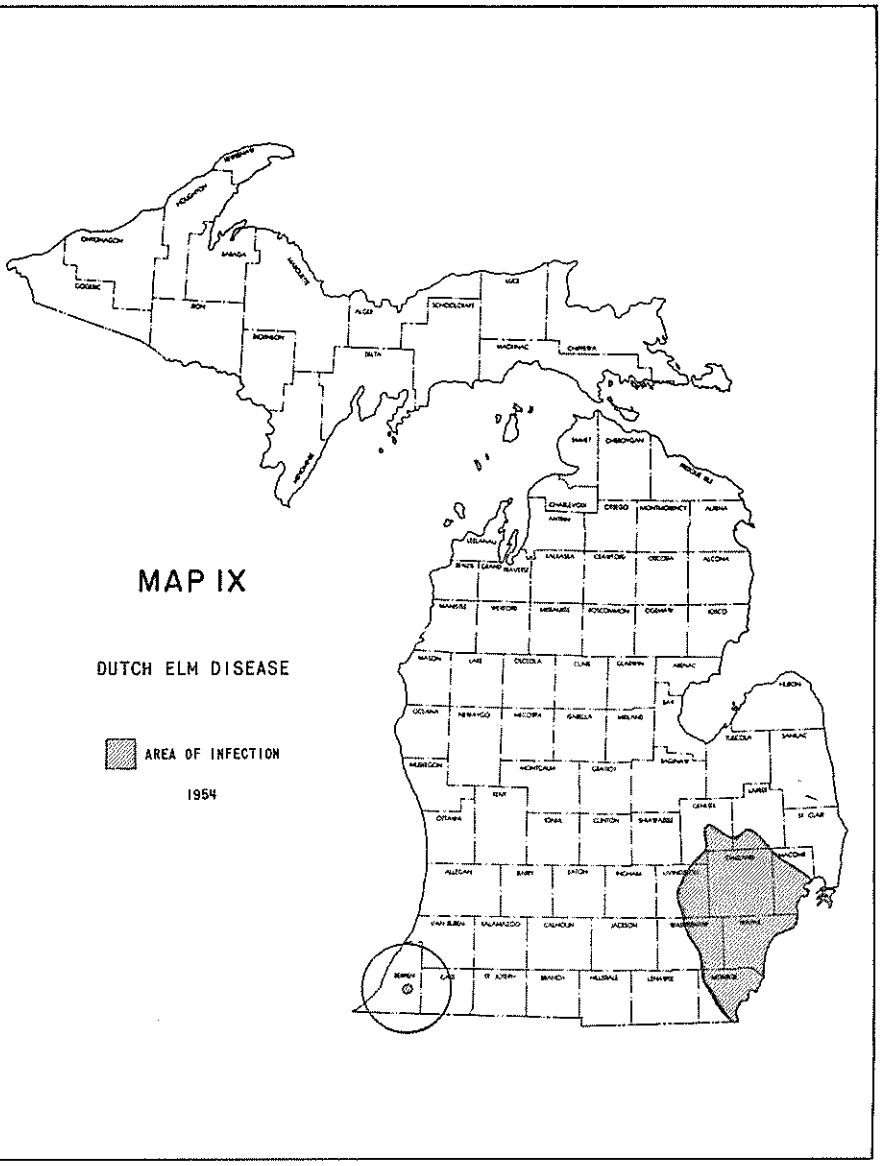
The removal of infected trees by land owners as a step toward control was again promoted and, with a few exceptions, was satisfactory from a compliance standpoint. An experimental area to study effects of control techniques was set up in Kent and parts of Barry, Ionia, Montcalm and Newaygo counties. Research is under the direction of Michigan State College with the State Department of Agriculture and the Michigan Department of Conservation cooperating.

DUTCH ELM DISEASE

Dutch elm disease was discovered in the Detroit area of Michigan in 1950, and has spread gradually into adjacent areas as far out as Lapeer, Genesee and Livingston counties. In addition, a single infected tree was found in Berrien County in 1954, the first in this area. (See Map IX). First occurrence of the disease in the Chicago, Illinois, area was also reported this year.

An aggressive program of survey and control, within the limits of available funds, has been conducted in Michigan under a cooperative arrangement between the Bureau of Plant Industry of the State Department of Agriculture, which is the coordinating agency, and local units of


MAP VIII
OAK WILT DISTRIBUTION
1954
COUNTIES WITH INFECTION
(Number of cases shown)
LIMITS OF INFECTION
1
20
1
2
22
2
2
3
1
1
15
20
6
5
3
29
28
3
2
2
2


MAP IX
DUTCH ELM DISEASE
AREA OF INFECTION
1954

government in the affected area. The Bureau is responsible for the survey and enforcement phase of the work, and the municipalities conduct the necessary sanitation and spraying. Property owners bear the cost of necessary tree removal where this must be done. Laboratory facilities for diagnosing Dutch elm disease and oak wilt specimens are located at Michigan State College.

The Bureau reports that surveys during 1954, supported by laboratory diagnosis, located approximately 3,100 diseased trees, nearly all of which were immediately destroyed. This is two and one-half times the number found in 1953. Fifty-five county, township and city governments carried on control projects with 36 of these reporting expenditures aggregating $337,000. Detroit alone spent $120,000.

WHITE PINE BLISTER RUST

The following information is taken from the "Annual Report of White Pine Blister Rust Control in Michigan" for 1954 prepared by the Area Leader for this cooperative federal-state project.

The reorganization of the U.S. Department of Agriculture resulted in the Blister Rust Control Office being transferred from the Bureau of Entomology and Plant Quarantine to the Forest Service on January 1, 1954. The State Leader's office became an Area Office and the States of Ohio and Indiana were added to the Area for over-all administration of control work by the Area Leader. In Michigan, the work is carried on under State laws administered by the Bureau of Plant Industry whose chief is the State Cooperator.

Weather conditions were not particularly favorable for rust development on *Ribes* during the summer of 1954. Rust development was moderate to heavy in the northern part of the Lower Peninsula and in the Upper Peninsula. Rust was light in the southern part of the Lower Peninsula. Conditions favorable to pine infection developed early in September, however, and remained favorable until leaves were shed. Rain and cool weather were prevalent during the entire fall period which could result in an increase of pine infection showing up two or three years hence.

Local control work provided protection for 18,236 acres by removing 381,151 *Ribes* bushes from 36,219 acres of control area. This work was accomplished at a cost of 3,490 man-days of labor, or slightly over five acres of pine protected per man-day. Labor for work on State and private land was provided principally from Conservation prison camps. Crews were used from six camps for a part or all of the season. Control work on the Fife Lake State Forest was carried out by locally recruited labor. Control work on the National Forests was accomplished by hired labor crews and by contractors. One contract covering 180 acres of control area was completed on private land.

SUMMARY

During the 1954 season, a total of 2,067 observation reports were received, an increase of 115 over the 1953 total. The total number of permanent observation areas is now 728.

Forest industry became an integral part of the Michigan Forest Pest Detection Program during the past year. Industrial foresters established 36 permanent observation areas from which 90 observation reports were received.

Five special insect surveys were conducted. Two of these were made to study the progress of the forest tent caterpillar outbreak, including an aerial survey to locate defoliation boundaries and intensities, and an egg mass survey to predetermine the approximate population densities in the infested areas for 1955. The other special surveys included a ground reconnaissance survey for the redheaded pine sawfly in the Grand Sable State Forest in Alger and Schoolcraft counties, a ground and aerial reconnaissance survey for the spruce budworm in Keweenaw County and a ground and aerial survey to map the walkingstick defoliation boundaries in Ogemaw, Crawford, Oscoda and Roscommon counties in the Lower Peninsula and in Dickinson County in the Upper Peninsula.

Direct control projects were carried out against populations of the redheaded pine sawfly in Schoolcraft County, the jack pine sawfly in Roscommon County, the European pine shoot moth in Ottawa and Muskegon counties and the Saratoga spittlebug in the Hiawatha and Ottawa National Forests.

Jack pine budworm populations continued to decline in the Lower Peninsula except locally in Lake and Grand Traverse counties but remained high in Luce County in the Upper Peninsula. The pest was reported for the first time from three locations in Marquette County.

Intensified survey in the northern half of the Lower Peninsula resulted in the detection of the larch sawfly over most of the state's tamarack-growing area.

Detection and positive identification of the European pine shoot moth in the Keweenaw Peninsula poses a new threat to existing and future red pine plantings in this area.

Forest tent caterpillar populations declined sharply in most infestation areas. Egg mass surveys indicate a further decline in 1955.

The gypsy moth was detected in the Lansing area and control measures were carried out over 86,400 acres. Further surveys have detected the pest near Grand Ledge and Portland. Control measures will be continued in 1955 to attempt to eradicate the insect in Michigan.

As a result of 1954 surveys for oak wilt, 55 new cases were found, bringing the total to 158.

Dutch elm disease surveys have located approximately 3,100 infected trees in parts of eight counties in the southeastern part of the state. A single infected tree was found in Berrien County in 1954, the first in this area. Fifty-five county, township and city agencies carried on control projects with 36 of these reporting expenditures of $337,000.

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